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# **Beyond the ostensible: an exploration of barriers to lean implementation and sustainability in healthcare**

## **Abstract**

The barriers to implement lean have been well researched and have generated consistent results; this study identifies these as ostensible barriers. There is a dearth of research that focus on understanding the causes of these ostensible barriers. Thus, this study aims to empirically investigate the deeper causes that produce ostensible barriers to implement lean in emergency areas of the healthcare. To achieve this aim, the paper draws on rich, qualitative data from four different sources of data, using exploratory case studies as the main approach. Undertaking thematic analysis, six main underlying barriers emerge as the root cause of ostensible barriers. The results suggest that addressing each of the underlying barriers in healthcare is likely to support lean implementation and sustainability, by reducing the impact of restraining forces that come from stakeholders and the public healthcare system.

Keywords: Lean Production, Lean Implementation, Barriers, Public Healthcare

**Word count:** 12671

## **1. Introduction**

The literature outlines several barriers to implementing lean, including but not limited to; people, lack of positive attitude and commitment to change the process (Radnor *et al.*, 2006), insufficient understanding of the potential benefits (Marodin and Saurin, 2015), resistance to change to something new or scepticism (Bhasin, 2012a), lack of resources (Bateman and Rich, 2003) and poor communication (Sim and Rogers, 2009). Whilst several studies offer descriptions of the barriers and their impact to implementing lean, there is a dearth of research that focuses on understanding the causes of these barriers

which we term ‘ostensible’. This study focuses on healthcare systems in developing countries, such as Brazil and draws on qualitative data to understand the deeper causes that influence the creation of these ostensible barriers in the Brazilian public healthcare, which we have termed ‘underlying’ barriers. The contribution of this research is to introduce and discuss underlying barriers, a contextual contribution in a developing country, and field forces analysis in order to identify barriers in healthcare.

The healthcare systems, both private and public, of any country seem to be constantly under pressure of cost reduction and increasing demand (Sisko *et al.*, 2018). Commonly, a public healthcare system that adopts the universal model of coverage based on use free of cost, faces pressures to provide timely healthcare assistance to taxpayers that claim to be paying their taxes in exchange of a reasonable level of service (Berwick, Nolan, and Whittington 2008; Paim *et al.*, 2011).

In the case of the Brazilian public healthcare (UHS) used as subject of this work, the system is facing difficulties to provide the wide coverage as planned in the Brazilian Constitution and expected by taxpayers (Bravo, 2001). The main challenges are related to: long waiting times; to receive treatment; to be transferred to a hospital bed and to perform basic and specialized tests (Almeida, Giovanella and Mendonça, 2010; Azevedo and Costa, 2010; Menucci, 2009; Paim *et al.*, 2011). These problems have concentrated in the emergency areas of UHS and have a direct impact in the treatment of the patients, waiting times and satisfaction (Derlet, and Richards, 2000) and, overcrowding (Ludwig and Bonilha, 2003).

Finding an approach that can ease these problems is a challenge in Brazil (Brandao de Souza, 2009) but the lean philosophy has emerged as one method (Mazzocato *et al.*, 2012; Naik *et al.*, 2011; Ryan *et al.*, 2013). Originally an approach to be used by

manufacturing companies (Womack, Jones and Ross, 1990; Womack and Jones, 1996; Yadav, Seth and Desai, 2018), lean has rapidly spread to the services areas (Allway and Corbett, 2002), with great focus and positive results in healthcare (Brandao de Souza, 2009; Burgess and Radnor, 2013; Mazzocato *et al.*, 2010).

Regardless of the popularity of lean, Jadhav, Mantha and Rane (2014) argue that even though lean is one of the most powerful quality improvement methodologies, nearly two-thirds of the implementations end in failure and less than one-fifth of those implemented have sustained results. These low rates of success are related to difficulties in dealing with barriers to the lean journey (Bhasin, 2012a). Thus, this paper seeks to understand the deeper causes that create the barriers that constrain the lean implementation and sustainability in the Brazilian public healthcare. Therefore, the following research question is proposed:

What are the underlying barriers that influence the creation of ostensible barriers to lean implementation in healthcare?

To answer this question, the paper first provides a review of the lean philosophy and its impact on healthcare, outlining the main hurdles to the lean journey depicted in the literature. Subsequently, the research methodology is introduced, showing that the paper draws on rich, qualitative data from four different sources of data within a case study in the emergency areas of UHS. Next, triangulating this data and using thematic analysis, the paper then identifies ostensible and underlying barriers to implementing lean in healthcare. Finally, using these findings together with Lewin's (1951) force field analysis model, the discussion and conclusion sections identify and discuss the main elements that act as restraining forces during the lean journey in healthcare and influence the creation of the

ostensible barriers. This section considers the theoretical and practical contribution of this paper and provides insights for further research.

## **2. The Brazilian public healthcare issues**

The healthcare system in Brazil is divided into private and public. The public healthcare system, also widely known as the Unified Health System (UHS) (*Sistema Unico de Saude – SUS*) is responsible for providing healthcare assistance free of charge for over 150 million people (ANS, 2013). The system is based on use free of cost and solely funded by the government resources, which together with federal government, states and municipalities support the administration of these resources in three different levels of the system: preventive, emergency and high specialization.

The preventive level is designed to provide assistance using general practitioners (GP) assistance for non-urgent care. The emergency level relies on emergency care units (ECU) and emergency departments (ED) also known as accident and emergency (A&E) within hospitals, treating situations that involve risk of death; it is considered an ‘open door’ model. The specialized level uses hospitals to perform a variety of highly specialized care, for example, chemotherapy, renal dialysis, heart surgery, transplant and complex tests (Ministry of Health, 2014).

A system such as UHS that has to provide wide coverage of healthcare services, presents a series of operational problems that affect patients (Dickson *et al.*, 2009) such as waiting times and queues to receive treatment, which includes seeing a physician and performing tests (Piola *et al.*, 2009; Solla and Chioro, 2008). These problems have a high concentration in the emergency level, as it operates as an ‘open door’ policy which can lead to high numbers of patients (Ipea, 2011; Ludwig and Bonilha, 2003).

The literature shows that these issues in emergency areas have been addressed using process improvements approaches, such as lean philosophy which was first applied in the manufacturing field (Womack, Jones and Roos, 1990) but later adapted to healthcare which has revealed positive results (Burgess and Radnor, 2013; Mazzocato *et al.*, 2010; Radnor *et al.*, 2006).

### **3. Lean philosophy: from manufacturing to healthcare**

Originally an approach developed by the Japanese company Toyota in the mid-50s and known as Toyota Production System (TPS) it was later termed as ‘lean thinking’ by Womack, Jones and Roos *et al.* (1990) and Womack and Jones (1996) in manufacturing companies in the West. The lean thinking focuses on waste elimination and creation of value for the customer. From the advent of the lean concept to the present day, the popularity of lean thinking has spread rapidly to other public and commercial sectors (Bateman, Hines, and Davidson, 2014; Leite and Vieira, 2015; Yadav, Seth and Desai, 2018). It became evident that reducing waste and creating value is not only for manufacturing applications (Allway and Corbett, 2002), indeed, after a long period of lean applications exclusively in manufacturing companies, the techniques were adapted to the services area with the same focus, to reduce waste and create value for ‘end-users’ (Radnor and Osborne, 2012, 10).

Several service areas, such as banks, offices and public services are applying lean (Bowen and Youngdahl, 1998), however, healthcare operations have received particular attention from academics and practitioners of lean in this area (Mazzocato *et al.*, 2012; Naik *et al.*, 2011; Ryan *et al.*, 2013). Different literature reviews about lean healthcare have been carried out the results show the growing of lean healthcare studies, positive results after implementation in hospitals’ operations and, the development of new tools and

approaches (Brandao de Souza, 2009; Mazzocato *et al.*, 2010; Radnor, 2010). These results about the growing relevance of lean in healthcare operations are not only theoretical but have a considerable number of practical results with several researchers publishing positive results (Kim *et al.*, 2007; Womack *et al.*, 2005).

The benefits are reported in different ways including cost reduction, process improvements, time savings, queue reduction, investment savings, reduction in wasted medication, improvements in time of patient admission and reduction in the average time to first appointment. There are also benefits more focused on patients, such as reduction of patient walking, increase in patient satisfaction, improved patient safety, reduced mortality, including others (Cima *et al.*, 2011; Mazzocato *et al.*, 2010; Radnor *et al.*, 2006).

Regardless of all the benefits that the lean implementation brings to the context in which it is implemented, the literature also shows that the lean journey (implementation and sustainability) faces substantial barriers that inhibit the success of the approach (Bhasin, 2012a; DeSanctis *et al.*, 2018; De Souza and Pidd, 2011; Lean Enterprise Institute, 2007; Kundu and Manohar, 2012; Radnor *et al.*, 2006; Yadav and Desai, 2017).

#### **4. Barriers to implementing lean**

Scholars within the literature have reported relative low rates of lean project success. Jadhav, Mantha and Rane (2014) argue that even though lean is one of the most powerful quality improvement methodologies, nearly two-thirds of the implementations culminate in failure and less than one-fifth of those implemented have sustained results. There are cases where the success rates are even lower, for instance, Bhasin and Burcher (2006) report that less than ten per cent of companies succeed at implementing or keeping the lean philosophy well instituted. Implementing lean has become a challenge for several organisations with



one of the main reasons being the lack of ability to cope with barriers faced across the implementation and sustainability process (Bhasin, 2012a; DeSanctis et al. 2018).

The barriers to implement and sustain lean have been identified across different sectors, such as public services (Radnor *et al.*, 2006), healthcare systems (De Souza and Pidd, 2011), manufacturing (Bhasin, 2012a; Yadav and Desai, 2017) and the IT service sector (Kundu and Manohar, 2012). To provide a comprehensive understanding of the barriers that constrain lean implementation Table 1 lists the barriers identified in the literature. Table 1 was developed undertaking a systematic review of the literature based on similar studies carried in this field (Brandao de Souza, 2009, Mazzocato et al. 2010, and Yadav and Desai, 2016) with a structured protocol to extract and review relevant papers. The literature review protocol also included guidance from scholars that conduct in-depth systematic literature review, such as Tranfield, Denyer and Smart (2003) and Westby *et al.*, (2008).

The main elements presented in the protocol for this study are based on a selection of the key words, peer-reviewed journals, definition of criteria of inclusion and exclusion as well as, saturation of the search. According to Tranfield, Denyer and Smart (2003) these painstaking procedures and detailing of the searching protocol ensure that the search can be replicated in the future.

To access relevant secondary data within the literature the researchers explored academic articles published in several databases including, Science Direct, Emerald Fulltext, Springer Link, Taylor and Francis Online, Ebsco, Medline, PubMed and Inderscience. The only non-academic source considered was the Lean Institute which was justified by the relevance of the institution in the field of study so was considered as a technical source. The publication's period considered for the search followed the

availability of the papers up to 2017. The criteria defined to carry out the searches followed suggestions from Brandao de Souza (2009) and were based on the saturation of the following key words: lean barriers, enablers, challenges, obstacles, constraints and healthcare. The predetermination of keywords to carry out search in databases during literature review is also encouraged by Robson (2011).

In order to select the papers an inclusion and exclusion criteria were used from Saunders (2011) who advocates that the use of predetermined explicit criteria can help to select relevant research studies during the literature review. Therefore, during the searching process the inclusion and exclusion criteria undertaken was based on academic peer-reviewed papers that matched the predetermined key words.

Finally, aiming to identify and select suitable papers a screening process was carried out in two phases. Firstly, selecting papers based on title, abstract and key words which led to an extensive review that selected 180 papers. The second phase involved a rigorous screening process based on abstract assessment, where the researchers reviewed article by article and tried to find contributions related to the key words used to find the papers. This reduced the final number to 115 papers selected.

...Insert Table 1 About Here...

The barriers identified in table 1 also have some degree of similarity with the challenges faced in the healthcare sector. This is confirmed by Drotz and Poksinska (2014) who advocate that similarly to what happens in the manufacturing settings lean practices implemented in healthcare also face significant barriers.

During the literature review it was found that some academics highlighted common barriers found in manufacturing context also emerged in healthcare settings which include;

fear of job losses (Andersen and Røvik, 2015; Fine *et al.* 2009; Kim *et al.*, 2007); personal and organisational cultural issues (De Souza and Pidd, 2011; D'Andreamatteo *et al.*, 2015; Kim *et al.*, 2007; Kinder and Burgoyne, 2013); poor communication (Albliwi *et al.*, 2014; Andersen, Røvik and Ingebrigtsen, 2014); people's lack of attitude and commitment (Kinder and Burgoyne, 2013, McDermott and Venditti, 2015; Poksinska, 2010); lack of resources (Aij *et al.*, 2013; Albliwi *et al.*, 2014; Andersen *et al.*, 2014); resistance to change (Aij *et al.*, 2013; Brandao de Souza and Pidd, 2011; Poksinska 2010); training and education (Aij *et al.*, 2013; Andersen, Røvik and Ingebrigtsen, 2014; Grove *et al.*, 2010); leadership failure/misunderstanding and lack of commitment and support (Al-Balushi, 2014; Drotz and Poksinska, 2014; Grove *et al.*, 2010); lack of long-term strategy (Andersen, Røvik and Ingebrigtsen, 2014; De Souza and Pidd, 2011; D'Andreamatteo *et al.*, 2015).

It is not unusual to find these barriers either in healthcare or manufacturing settings. However, there are other barriers that are specifically found in and related to the healthcare context. For instance, the literature shows professional boundaries, healthcare fidelity and need for evidence-based as specific barriers found when transferring lean into the healthcare settings (Dixon-Woods *et al.*, 2013; De Sousa and Pidd, 2011; Radnor *et al.*, 2006)

Professional boundaries also known as professionalism is a common phenomenon found during lean implementation (De Sousa and Pidd, 2011; Stanton *et al.*, 2014). It involves the power and influence of staff members (physicians and nurses) that work in a fragmented structure in a hospital (Fillingham, 2008; Waring and Bishop, 2010). Power and culture are two strong elements in the healthcare structure that usually emerge as a barrier

in lean implementation in terms of professional and functional silos developed within the fragmented structure of the healthcare (Radnor et al., 2006; De Sousa and Pidd, 2011).

When working in silos healthcare practitioners are separated in professional groups which has a great impact on communication, interaction and protectionism of areas in healthcare (De Sousa and Pidd, 2011), and works against lean practices such as teamwork and decentralization of power (Drotz and Poksinska, 2014). Some of these problems related to professionalism were identified during lean implementation in healthcare institutions such as ThedaCare, Royal Bolton and Flinders Medical Centre (Ben-Tovim et al., 2008; Radnor, 2010b; Toussaint, 2009; Womack et al., 2005).

The healthcare fidelity in replicating lean in healthcare is another barrier found during implementation. For example, implementing techniques adapted from manufacturing plants to improve quality and safety in healthcare settings has been a challenge so as a consequence the results sometimes are considered superficial, with no meaningful changes, low rates of success and difficult to replicate (Davidoff *et al.*, 2014; Dixon-Woods *et al.*, 2013). According to Glouberman and Zimmerman (2002) some of the difficulties to sustain change in healthcare emerge from the complexity of this setting which includes its challenging technical, social, institutional and political context.

Nevertheless, the challenge is not only related to transferring from manufacturing to healthcare, constraints also exist during attempts to replicate lean initiatives across healthcare areas. Dixon-Woods et al. (2013) argue that this often brings some disconcerting effects such as failure to outperform the secular trend and the decline effect when the intervention does not deliver successful results during replication in the new context thereby, jeopardising the sustainability and leading to failure (Dixon-Woods *et al.*, 2011).

This discussion about lean replication contributes to another contemporary healthcare challenge that has been discussed within the literature which is the need for evidence of the benefits of the lean approach (Andersen *et al.*, 2013). Most of the studies in lean healthcare present positive results. However, sometimes they have limitations such as poor case studies, weak design and methodology which affects the validity and generalizations of results (Alexander and Hearld, 2009; Mazzocato *et al.*, 2010; Young and McClean, 2008). The main barrier according to Andersen, Røvik and Ingebrigtsen (2014) is the replication of study designs which have limited adaptations and do not account for contingency factors that are needed to translate the findings from one setting to another. This barrier found within the literature states that lean is unique and to be adopted successfully it must consider that it is context dependent and so pure replication will not be sustained (Bateman, Hines and Davidson 2014; Bhasin, 2012; Kaplan *et al.*, 2010; Leite and Vieira, 2015; Radnor and Osborne, 2012).

During the identification of these barriers (Table 1), a high level of commonality was noted (Mostafa, Dumrak, and Soltan 2013). However, what is missing from these barriers is an analysis of their deeper causes that influence their creation. It can be suggested that these barriers themselves already shed understanding about the challenges to implement lean (Bhasin, 2012a). Others would argue that there are underlying causes that should be investigated, as Hines, Holweg, and Rich (2004) first advocated in their study about ‘enablers’ using the ‘lean iceberg model’ to illustrate underlying enablers that are behind ordinary ones. Therefore, the research presented in this paper aims to understand the underlying factors by investigating the introduction of lean into emergency areas of the Brazilian healthcare system.

## **5. Methodology**

To achieve the aims of this research it is important to define and follow a clear methodology. Therefore, this section aims to explain the methodological procedures carried out to access and analyse the data. Undertaking a qualitative methodology the researchers adopted exploratory case studies as the primary strategy. Semi-structured interviews and observations across four different sources of data collection were used to access data; lean management consultants, staff members in private hospitals, and staff members and patients from ECU and ED. From this data it was possible to carry out thematic analysis and triangulate to access in-depth results. This section provides further explanation and details of the methodological approach.

This is an exploratory study that aims to understand a new perspective on the barriers that influence lean implementation and sustainability by looking into the underlying causes of those barriers. A case study research based on four sources of data was taken. In the operations management field, the use of case study research is encouraged by different scholars (Karlsson and Åhlström, 1995). Voss (2010) advocates that despite all challenges in conducting a case study, such as time-consuming, resources constraints and others, this is still a powerful research method in operations management field that provides an opportunity for in-depth observation.

Case study is a common strategy used amongst academics that investigate lean (Mazzocato et al., 2012; Yadav, Seth and Desai, 2018; Wikner et al., 2017). Seth, Seth and Dhariwal (2017) used case studies when analysing lean application in complex production environments advocating that they allowed the phenomenon to be studied in relation to its real-life context facilitating rich dialogue. According to Garza-Reyes et al. (2018) who studied lean implementation in the logistics sector an exploratory case study approach can provide critical and empirical information about the phenomenon under analysis. Finally,

the case study has been suggested as a valid research strategy particularly encouraged when the focus of the study cannot be separated from the context where it occurs (Cameron and Price 2009; Collis and Hussey, 2013; Eisenhardt, 1989).

Figure 1 outlines the research framework, where case study research was undertaken using four sources of data collection. These sources were separated in lean experiences by private healthcare and emergency area of the public healthcare system. Lean experiences in private healthcare can be divided into two main sources: lean management consultants and staff members in a lean private hospital. On the other hand, experiences from emergency areas of the public healthcare system was provided from two main sources: staff members, physicians from ECU and ED.

...Insert Figure 1 About Here...

Lean management consultants are considered people with a high-level of knowledge of the lean philosophy, principally with experience in the healthcare sector. Some examples of these practitioners are management consultants in the lean domain e.g. local Lean Enterprise Academy or Institute, or, consultancy offices.

Staff in a lean private hospital contributed with their own experience in this field and highlighted the main barriers to lean implementation within the context of the public healthcare system. Both lean management consultants and staff in the private hospital were interviewed to access information about their previous experience working with lean projects in healthcare. This approach is encouraged by Saunders (2011) who argues that interviews with practitioners and experts in the subject are a great method to access the data needed.

The ED in public hospitals and ECU detached units are places to access data about the current and real situation in the public healthcare system. Observation and interviews in these venues considered people involved in the process of co-production, such as staff members, physicians and patients. Their point of view associated with patients' pathway observation and analysis reflected barriers for the lean implementation (culture, regulations, resources, process).

Table 2 outlines the case study sources, showing whom and how many were interviewed or observed. In total 43 semi-structured interviews (Robson, 2011; Yin, 2014) were conducted with physicians, nurses, social care practitioners and patients across UHS sites, whilst in the private system, interviews with nurses and project managers were carried out, and finally, the lean management consultants as specialists were interviewed. The interview in the emergency areas with healthcare staff members aimed to understand the barriers to implement lean in this environment, whilst interview with patients tried to identify the main problems faced when they seek healthcare assistance.

The lean management consultants' selection for the interviews considered the most influential experts in lean healthcare in Brazil. Amongst these people were book writers, keynote speakers, pioneers in lean healthcare in Brazil and management consultants with considerable experience in the area.

...Insert Table 2 About Here...

Additionally, data from patients' pathway observation was collected. The data from observation was collected using participant as observer method (Collis and Hussey, 2014; Saunders, 2011). Ten patients had their entire journey observed from admission process until discharging. The observation aimed to understand the patients and staff members'



interactions across the patient's journey within the emergency areas of UHS highlighting the main issues observed during its journey.

The use of different sources in this case study provided an opportunity to triangulate the data allowing access to different levels of reality (Bryman and Bell, 2005). Collecting data across multiples sources within case study research and undertaking different methods such as interviews and observations enables cross-checking of data and ensures that the evidence reflects the consistency of findings and the research trustworthiness (Denzin, 1978; Patton, 1999).

The interview questions considered during the data collection across the four sources of this case study are described in Table 3. The interview questions were framed to provide a response to the research question which is anchored on the understanding of the barriers to implementing lean in the healthcare. Aiming to understand each source's point of view the same questions were either asked to multiple sources or specific questions were asked to only one source. For instance, as patients could not answer questions about lean they were only asked questions about problems faced during their journey in the emergency areas of UHS. Whereas, questions about the barriers found in UHS could be answered by lean management consultants, a lean team in private hospital and, staff in UHS.

...Insert Table 3 About Here...

Semi-structured interviews were used to collect data, and the questions were based around themes to start the interview process, followed by some key-words called 'pick-ups' based on literature (Table 1) to engage the discussion. This approach is encouraged by Robson (2011). Additionally, where necessary, the questions were followed by new issues

that emerged. All 43 interviews were transcribed and additional ‘reflective notes’ were developed during the case study (Radnor, 2002).

Due to the nature of the qualitative data it tends to generate a large non-standardized and cumbersome database. Therefore, the data analysis becomes an important and challenging phase of the research (Bryman and Bell, 2011; Collis and Hussey, 2014). The method chosen to analyse the data will vary according to different elements such as research philosophy, qualitative or quantitative data collected, whether the data is primary or secondary as well as methods to access these data (Collis and Hussey, 2014; Saunders, 2011). Undertaking thematic analysis which is one of the most common methods within the qualitative field allows the researcher to code and keep tracking of the data (Braun and Clark, 2016). Moreover, Radnor and O'Mahoney (2013) advocate that this method of analysis can enable a level of sensitivity of details and context, likewise accurate access to information. Therefore, to analyse the data collected in this case study, an adapted model based on Braun and Clark (2006) and Radnor's (2002) suggestions were used, performing six main steps from initial coding to main themes, and finally interpreting the data (Figure 2).

...Insert Figure 2 About Here...

The model from the experiences of Braun and Clarke (2006) and Radnor (2002) provides a step-by-step data analysis, illustrating the methods with several practical examples about the technique, which provides support and a ‘friendly’ technique for researchers to analyse their own data collection. This standardized model has been previously used in the operations management field as reported by Radnor and Johnston

(2013) during the investigation of lean in the UK government. In order to provide validation of the findings, reports of the four case study sources were produced.

## **6. Findings**

The research findings will be presented based on those related to ostensible and underlying barriers with specific focus on the underlying barriers which are considered the root cause of other barriers.

### ***6.1 Ostensible Barriers***

From the data analysis twenty barriers emerged as main constraints to the lean implementation in UHS (Table 4). The barriers come from the four different sources of data collection. Analysis of table 4 shows that most of the barriers are common in at least two sources, except the financial barrier, the structure of the system that affects physicians and, public servant tenured career. Regardless of the fact that those barriers only appeared in the ECU source, they are still relevant for this study, particularly when compared to literature or context of the research (Bateman and Rich, 2003; Fillingham, 2008; Marodin and Saurin, 2015).

The barriers found during this research can be also separated into three main categories. It does not mean a strict categorization, where one barrier cannot be part of another category, but it is just a way to illustrate that they are common within some areas. The categories from where the barriers emerged are: 1) literature, which represents barriers that are common within the literature (Table 1); 2) UHS context, which represents the barriers that come from the context of the emergency level of UHS, such as the UHS bureaucratic style, slow pace of change in UHS, public servant tenured career; 3) practitioners' knowledge, which represents barriers that emerged from specific and

advanced lean knowledge that comes from lean management consultants and staff from a lean private hospital, for instance lack of long-term strategy and performance management.

...Insert Table 4 About Here...

These 20 barriers found in UHS can be named ‘ostensible barriers’ as they appeared to be the real cause. However, the data analysis found there to be other causes influencing the creation of these barriers. These can be defined as underlying causes of the barriers in UHS and are presented in the following section.

## **6.2     *Underlying Barriers***

The categorization of the underlying barriers was based on Braun and Clarke’s (2006) suggestion of thematic analysis. The analysis was carried out based on an inductive process of clustering the codes and sub-themes, around one main theme and checking the theme repetition (Robson, 2011) which is illustrated in figure 2. During the data analysis the underlying barriers emerged as main themes, the ostensible barriers as sub-themes and, additional and general information related to the barriers emerged as codes.

Table 5 displays the results from the thematic analysis, indicating the frequency that respondents provided information related to a specific underlying barrier. These barriers together with evidence from data will be discussed in the following sections.

...Insert Table 5 About Here...

Physicians’ influence within the process: As physicians deliver substantial ‘value add’ to patients during the service delivery process in healthcare they can be considered an important element in the co-production process. The physician will perform one of the most skilled activities and will determine whether the patient should receive treatment or be

discharged. Thus, a main theme called ‘physicians’ influence within the process’ emerged from data analysis with 9.6% of the frequency of the codes related to this subject (Table 5). This underlying barrier was identified as the cause of four ostensible barriers: ‘physicians lack of commitment’, ‘physicians’ resistance to change’, ‘public servant tenured career’ and ‘fear that lean will cause job losses’.

Additionally to these ostensible barriers, there were some further codes that emerged during the data analysis that also supported the findings related to this underlying barrier. These codes were merged into different sub-themes as follows: physicians’ involvement, affecting system, affecting patient and, affecting clinical staff.

According to the data analysed the physicians’ involvement brings contribution to this underlying barrier as it addresses the positive view of having a key healthcare professional involved in a lean project. Moreover, it could be argued that physicians are interested in seeing the process working well. Nevertheless, there is also a negative influence when their behaviour affects the system, patients and clinical staff. Physicians can be resistant to changes that they do not understand, therefore, affecting the system. There are cases shown during the analysis that have presented a lack of commitment from physicians which increased the waiting time and affected the patient. These situations illustrate the influence and impact of the physicians within the process which was also advocated by a clinical staff member from a hospital that have implemented lean:

So when you can involve the doctor it’s even better, because the doctor is always difficult to convince about something new, they are always open to studies and learn new techniques, however is a little bit difficult to talk with them. When you have a doctor in the project it helps a lot. (Clinical Staff from Private Hospital)

The information discussed above raises awareness about the involvement of the physicians in the lean journey. It shows that their influence within the process is an

underlying barrier that should be considered during lean implementation and sustainability so this can ease or avoid ostensible barriers.

Patients' behaviour in emergency areas: The patient as the main user, creates demand and receives the service delivered. According to Womack and Jones (1996) providing value at the right time to customers is one of the key principles of the lean philosophy. Thus, it is important to bring this concept of value delivering into the healthcare setting especially because the patient is probably the most important element in the consumption process in healthcare.

The patient's behaviour in emergency areas emerged as an underlying barrier with 16.2% of the frequency of the codes during the data analysis (Table 5). It shows that patient's behaviour influences the creation of the ostensible barriers 'non-urgent patients' presence in emergency areas' and 'emotional stress between patients, staff members and physicians' (Table 4). Additionally the sub-theme that addresses the patient's impact on physicians emerged and will be discussed.

The data analysis has shown that non-urgent patients in emergency departments influence demand, creating an unstable operation. This also motivates the generation of emotional stress and tensions between patients and clinical staff members (Table 4). There were cases observed by the researchers during the data collection where patients become aggressive and started arguing with clinical staff. The presence of non-urgent patients within the process also affects the physician. This situation is related to some of the codes found during the data analysis, for instance, stress between patients and physicians because of the physician not issuing a sick note if the patient was not urgent. Patients that did not have urgent situations became aggressive when they were referred to GPs. According to physicians and clinical staff this situation could be avoided if the non-urgent patients

sought assistance at the GPs, however, they either did not find the GP available, or just went directly to the emergency areas:

The delay here (emergency area) is because the demand is too big, and sometimes they (patients) come from another place, because they've been instructed to come here. If I was this patient I'd be very upset, because they go to the GP and they can't be seen there, so they come here and have to wait for 4 or 5 hours for a simple thing. (Nurse from an emergency care unit)

When it comes to lean implementation and sustainability it is important to consider the impact of the patients' behaviour within the emergency areas as it generates a variety of demands that are not necessarily linked to the service as planned or provided i.e. routine rather than emergency care.

Constraints related to resource management affecting staff: When resources are not available it starts to impact on staff performance. Based on interviews with staff members and observations of the process this main theme regarding resource constraints emerged as an underlying barrier. The analysis shows 14.4% frequency of the codes (Table 5) that this underlying barrier motivates the creation of the ostensible barriers; 'financial barrier to implement lean', 'nurses performing different activities that are not core' and, 'poor management of resources' (Table 4).

The financial barrier to implement lean is related to lack of resources. It emerged as a sub-theme in the data analysis bringing several related codes such as; shortage of staff, lack of material, medication and conditions to perform the work, amongst others. The next sub-theme 'poor management of resources' addresses issues such as; lack of control of resources, lack of control about waiting time, shifts are not levelled according to demand, lack of material control and, poor quality of material/equipment that generates waste. When a new project, such as lean, is suggested there is a fear that it can increase the cost or even

demand creating a barrier not just to implement but, to sustain the lean journey, as explained by a nurse:

When you have to make a change that you have to buy something that will involve money, it also becomes difficult in the public service. You know that everything takes time and need a public bid. (Nurse from an emergency care unit)

Overall, if lean is attempted to be implemented in the scenario where there is lack and poor management of resources, resistance might arise from staff members which could lead to discouragement to support and sustain changes.

The UHS model impacts on physicians work: As physicians deliver substantial value add to patients in the co-production process, when their environment starts to affect their job and performance it could directly impact on the service delivered to patients. This underlying barrier emerged with 10.3% frequency of the codes during the data analysis (Table 5) and causes the ostensible barriers; ‘the structure of the system affects the physicians’ and ‘physicians spend time performing activities that are not core’.

On several occasions during the interview process the UHS structure was highlighted as a barrier for physicians’ work. The model or style that the system operates shows that the physicians are affected when they have to perform activities that are bureaucratic and not specifically related to delivering value to the patient. This is also linked to another ostensible barrier that emerged during the analysis, which is ‘the physicians spending time with non-core activities’ (Table 4). For instance, performing activities that are not core is something that most of the physicians admit to being a waste of their time and creates frustration.

Sometimes I have to go after people, I don’t know how to measure exactly but I can say I spend about two hours making prescriptions, doing these bureaucratic things, in my opinion this is where we waste more time, in this bureaucratic question. I think



most of the time, about 90% is solving problems, calling people, updating the system. The other part of my time is seeing patients. (Physician from and Emergency Care Unit)

These situations that affect the physicians' work can lead to demotivation and discouragement which start to affect the quality of the service delivered by the physicians. Summarizing, this underlying barrier represents a decrease of focus on value added activities and an increase in waste bringing disruptions across the process.

The model that UHS operates creates constraints: This underlying barrier emerged from data analysis with 15.8% frequency of the codes (Table 5). It was identified as the cause of three ostensible barriers; 'UHS bureaucratic style as a barrier to lean', 'public system lack of interest/motivation in changing' and 'differences between service delivered in public and private/performance management' (Table 4).

This underlying barrier also tackles issues related to UHS influence on the patient's journey as well as the misinterpretation about the emergency level purpose. There is a misunderstanding about the purpose of each level (preventive, emergency and specialized) of UHS. It was found that even other areas in UHS did not understand properly the aim of the emergency area, consequently demand is moved from other areas, this can create bottlenecks in the emergency areas as explained by a physician:

So they have a limited capacity there (at the GP), a limited number of patients to be seen, like 'the GP will close, you aren't an emergency, you can come tomorrow. That's why they come here, because we work 24hours, like they think: I can wait 3, 5 or even 6 hours, but I'll be seen (laughs). (Physician from and Emergency Care Unit)

The testimony above shows that the emergency area will be the place chosen by a patient to find the solution to their issue. Thus, from the emergency area point of view, this situation creates problems with patient flow, such as long waiting times, dissatisfaction,

stress and poor quality of service. This is one example of how UHS affects the patients creating difficulties for them to access timely care.

Overall UHS is seen as a bureaucratic system that restrains initiatives of improvement and, only substantial changes would bring improvements to the system. However, this seems to be a matter of long-term commitment:

It'll take a long time, it's necessary to change this Government, change this culture that the Brazilians have of outsourcing the responsibility, I think they should be more responsible and have more commitment. I think it will take a few years, unless they make a very big movement of improvement of processes in hospitals. (Lean Management Consultant)

The UHS cultural style influences directly on the patients as the main users of this co-production process and so, could influence attempts to implement lean.

Influence of the clinical staff behaviour as a barrier to lean: Similar to physicians, clinical staff are also relevant to the service delivery process and consequently to lean implementation. During the data analysis this underlying barrier emerged with 33.7% frequency of the codes related to this subject (Table 5).

Clinical staff members work in front line operations, receiving patients and supporting the physicians' requests. The influence of the clinical staff behaviour on lean is an underlying barrier that was identified as the cause of five ostensible barriers; 'clinical staff resistance to change', 'fear that lean will cause job losses', 'lack of lean knowledge and experience', 'communication disruptions amongst staff and between shifts' and 'the administration or leadership can be a barrier to lean' (Table 4).

There are other relevant codes that also emerged during the data analysis and strengthen the view about the clinical staff behaviour as an underlying barrier to lean. For

instance, the staff behaviour towards the patients raises the discussion about the lack of focus on patient flow within the emergency areas of UHS. Furthermore, findings have also showed a positive view that if the staff members understand and participate in the lean project they will feel part of it. This was explained by a staff member from a lean private hospital:

Let's make a project here in the emergency room, so let's see who will be involved here, then you question what are the problems, and they know what the problems are, then you take these people, all of them who participate in the process, explain the purpose, train and leave them doing the process, then I think you can get a large insertion, with everyone involved. (Clinical Staff from Private Hospital)

The lean project needs the involvement of people to succeed. Therefore, if the staff members do not engage with the lean implementation it could affect the patients, as improvements will not reach the most important person in the consumption process.

This section presented the findings from the data analysis which can be separated into two main findings; identification of ostensible barriers and underlying barriers. The ostensible barriers, many of which were recognized from the literature, have some interesting characteristics. Firstly, they are easy to identify and so, can be tackled particularly with a tools-based lean approach, for instance, communication might be found as an issue within the organisation, therefore tools such as, standardization or visual communication might be a tool to tackle this problem. Secondly, ostensible barriers appear to be the real cause, however, as this research has identified, the real causes might lie deeper.

It could be argued that there are fewer underlying barriers although they are strong inhibitors in lean implementation. Underlying barriers are linked with people's behaviour

and organisation's style which makes them more difficult to identify as they are not overtly tangible. In contrast with the ostensible barriers, underlying barriers do not come from the literature but emerge from the field investigation after consideration of the causes of ostensible barriers.

Overall, when analysing these barriers it is possible to notice the influence of four elements; patients, physicians, clinical staff members and UHS. Which themselves can be separated into stakeholders and UHS. The next section will provide a discussion about the importance of these barriers in the context of lean implementation in UHS. Furthermore, new literature to support some findings related to the influence of stakeholders and the healthcare public system will be presented.

## **7. Discussion**

This paper has presented two types of barriers to implement lean. First, the ostensible barriers, which could be considered as common visible constraints often based on tools (Burgess and Radnor, 2013; Costa and Godinho, 2016; Spear, 2004). The ostensible barriers appear to be the real cause, but in reality there are other deeper causes which lead to the second type of barriers - underlying barriers, which are less-visible which emerged from the rich, qualitative data in the case study about the emergency areas of UHS. These barriers are fewer but could be argued as the root cause that influences the creation of the ostensible barriers. The findings have shown that the behaviour of stakeholders and the UHS management style are the main influencers of the underlying barriers.

### ***7.1 Underlying Barriers, Stakeholders and UHS Relationship***

The data analysis has shown that most of the time stakeholders and UHS constrain the service delivered which influences the underlying barriers. For example, a non-urgent patient can create unexpected demand and bottlenecks across the process which affects the

capacity of the healthcare system or, UHS can constrain the process when resources are not available to provide the right care which directly affects staff performance and ability to keep the process stable.

To understand and provide support for discussion about this relationship between stakeholders, UHS and, underlying barriers it is important to understand the concept of services in this context. The healthcare system is a service with high co-production and simultaneous consumption processes (Osborne, Radnor, and Nasi 2013). In services, as opposed to manufacturing, production and consumption usually occurs simultaneously (Normann, 1991). This means that the patient is actively participating during the service delivery process.

Nevertheless, in the healthcare setting the service delivery process and co-production goes beyond patient participation, by also being influenced by other professional such as physicians, who deliver the ‘value add’ and clinical staff members who provide support across the patients’ pathway. Osborne and Strokosch (2013) argue that a given surgical procedure is influenced as much by the individual pathology of a patient as by the skills of the physician. At a fundamental level co-production is not an ‘add-on’ to services but a core feature of them. The same concept also applies to nurses and other healthcare staff delivering procedures during the co-production and consumption process. Likewise, as the main provider of the services, UHS has a strong influence in the co-production process as it controls the resources and rules in this setting.

This strong influence of stakeholders and the public healthcare system (which will be addressed only as ‘system’) in the co-production process is illustrated by underlying barriers to implement lean. Each of the barriers represents an influence from either a stakeholder or the system. Figure 3 shows that when moving in opposite directions from the

value add, stakeholders and UHS a negative influence or force is created in the expected value add and generated ostensible barriers. Value added is one of the key principles of the lean philosophy (Womack and Jones, 2003) therefore when stakeholders and UHS move against the value added, they inhibit attempts to improve the process across the patients' pathway.

To understand the 'forces' acting in the service delivery process in the emergency area of UHS it was found to be useful to recall Lewin's study from 1951 which presents a Force Field Analysis and its impact on encouragement and discouragement of behaviour of individuals and organisations (Lewin, 1951). This behavioural model shows that there is a field which represents the environment (field) and, an objective or a reward (central field) that a given person or organisation wants to achieve. In this field there are variable forces acting independently in a positive (driving forces) or negative (restraining forces) way towards or against the central field.

This explanation of force field analysis from Lewin (1951) can be related to the research outcomes found in emergency areas of UHS. Figure 3 presents an adapted analysis as 'Field of Forces in Healthcare' to illustrate the findings Figure 3 illustrates that stakeholders and the system often had a negative influence (restraining forces, represented by the dotted arrows) in the process of lean implementation in the emergency areas of UHS, repulsing the central field which is the service delivered or value added in healthcare.

...Insert Figure 3 About Here...

As discussed in the healthcare process stakeholders and the system are interdependent during the co-production process. So we argue that when they work as independent and restraining forces driving the service delivered towards their own interests

they create disruptions across the processes. This research found that when they act independently, in a negative way, there is little recognition about the possible effects in delivering the service. This situation was found to create ostensible and underlying barriers and inhibit lean implementation.

## ***7.2 Lean Implications***

The six underlying barriers found in this study raise important implications for the lean implementation and sustainability. Table 6 outlines these implications as well as how the restraining forces impact lean discussed in the previous section (Figure 3).

...Insert Table 6 About Here...

From this study we can develop some propositions. The first one addresses the ostensible barrier physicians' influence within the process during the lean journey (Table 6). Some ostensible barriers emerged raising awareness of the physicians' influence within the process showing how as an underlying barrier it can influence the creation of different hurdles across the lean journey. For instance, lack of commitment, resistance to change and, fear of job losses (De Souza and Pidd, 2011; Malmbrandt and Ahlstrom, 2013; Sim and Rogers, 2009; Yadav and Desai, 2017). It shows that physicians are key stakeholders in the healthcare service delivery process and having them involved in the process of change is an enabler that can support the lean implementation and sustainability. This raises the following proposition:

Proposition 1: Physicians play a critical role in lean implementation and sustainability. They are the ones who deliver substantial value add to patients so it is important to have them engaged in the lean project.

It is important to understand that there is still a dearth of research addressing the influence of physicians across the lean journey in healthcare. Thus, this proposition emerged from empirical data and discussions available within the literature. For instance, Caldwell, Brexler and Gillem (2005) discuss the relevance of physicians and their engagement to implement and sustain lean in healthcare. Moreover, Fine et al. (2009) address the important role developed by physicians during the lean journey and suggest that to increase their engagement, it is necessary to demonstrate the lean benefits in their daily routine, for instance reducing time wasted and increasing performance.

The second proposition considers the underlying barrier related to patients' behaviour (table 6) together with the ostensible barrier public servant tenured career (table 4) relating to the contextual and cultural aspects that impact on lean implementation. For instance, non-urgent patients (Azevedo and Costa, 2010; Bulletin of the World Health Organisation, 2010) can cause different constraints such as; increasing demand, usage of the incorrect level of care, unnecessary requests and, requesting sick notes to justify work absence. According to interviewees this is becoming part of the culture where patients have already developed a pattern to seek care in emergency areas no matter how meagre their health condition. In terms of a public servant tenured career, the study found that due to the security of a job for life, tenured staff do not engage easily in new processes for change. This leads to the following proposition:

Proposition 2: The contextual and cultural aspects create underlying barriers which influence the creation of inhibitors for lean implementation.

This proposition echoes discussions about the context where lean is implemented, for instance, the literature shows that lean is context dependent and adapting it to the implementation context is fundamental to increasing its chances of success (Bateman,



Hines and Davison, 2014; Radnor and Osborne, 2012). Examples of the cultural and context impact are reported within the literature including, De Souza and Pidd (2011) who argue about the cultural issues based on healthcare staff. Other academics suggest practitioners not to underestimate the cultural differences and identify those barriers that impact on lean implementation and sustainability (Boyer and Sovilla, 2003; Erthal and Marques, 2018; Jadhav, Mantha and Rane, 2014; Kim et al. 2006).

The propositions presented in this section summarize the discussion of this paper about the impact of the underlying barriers during the lean journey. The research findings shows that underlying barriers generate ostensible barriers which is influenced by stakeholders and the public healthcare system which act as restraining forces affecting the service delivered and value add. As one of the main lean principles, value add to customers (Womack and Jones, 2003), these relationships constrain the lean implementation and sustainability.

## **8. Conclusion**

This paper aimed to understand the deeper causes that influence the creation of ostensible barriers in healthcare - these were identified as underlying barriers. The aim of this research echoes previous studies that advocate the need to investigate deeper causes that can enable the lean journey rather than just focus on visible elements commonly related to tools-based approach (Burgess and Radnor, 2013; Costa and Godinho Filho, 2016; Hines, Holweg, and Rich 2004; Spear, 2004). In contrast to previous studies that tackle lean enablers this research focused on deeper causes that could constrain the lean journey in healthcare. To better understand these deeper causes in healthcare this research asked the question: ‘what are the underlying barriers that influence the creation of ostensible barriers during the lean journey in healthcare?’

The results have shown that there are two types of barriers, ostensible and underlying. The ostensible barriers fall in the category of barriers that are usually common during the lean journey but have deeper causes that influence their creation. These barriers come from literature, UHS context and practitioners knowledge. On the contrary, underlying barriers are drawn on rich qualitative data emerging as the root cause of the ostensible. Six of these barriers were identified and, based on an adapted version of Lewin's force field analysis (Lewin, 1951) has shown that the underlying barriers have strong influence of the stakeholders and system thus impacting greatly on the lean journey.

This study contributes to the discipline of operations management by providing invaluable theoretical, practical and policymakers' contributions. This can be separated into two main implications; to knowledge and academicians and, to managers and policymakers.

***Implications to knowledge and academicians:*** The new body of knowledge that this study brings can be separated into three main theoretical contributions: underlying barriers, contextual contribution, and field of forces in healthcare.

Underlying barriers: the main contribution of this research lies in a new understanding about the relationship between the six underlying barriers, restraining forces and ostensible barriers during the lean journey in the healthcare setting (Table 6). Qualitative evidence shows that underlying barriers generate ostensible barriers, and this process is influenced by the behaviour of stakeholders and the Brazilian public healthcare system that act as restraining forces affecting the service delivered and value-added in the emergency level of UHS. Therefore, addressing each of the underlying barriers in healthcare might support the lean implementation and sustainability reducing the impact of restraining forces that come from stakeholders and UHS. This contribution might help

healthcare practitioners and lean management consultants to avoid the creation of inhibitors during the lean journey in the healthcare setting.

**Contextual contribution:** to be adopted successfully lean must be adapted to its context. It is vital to understand that lean is context dependent (Bateman, Hines, and Davidson, 2014; Leite and Vieira, 2015; Radnor and Osborne, 2012). Introducing discussion about the context in which lean is implemented the research establishes a triangulation between literature, research findings and contribution related to the context. Sometimes the context of the research also matters in terms of contribution for example, this research was carried out in an uncharted field for lean. The findings have shown that patients as well as physicians might negatively influence the lean implementation and staff members (tenured career) which might happen only in this type of context. Thus, this study represents a new understanding and contribution to the knowledge for future research in terms of transferring lean philosophy into the public healthcare system in a developing country.

**Field of forces in healthcare:** a field of forces in healthcare (Figure 3) was developed using Lewin's force field analysis (Lewin, 1951) as background to understanding the interplay between underlying barriers, restraining forces from stakeholders and UHS, and the creation of the ostensible barriers. Thus, this research contributes by bringing a theoretical framework that might be used to find underlying barriers in other contexts or other areas of the hospitals.

***Implications to managers and policymakers:*** the contributions to the knowledge also start to bring the practitioners closer to the practical contributions of this research which are underpinned as managers and policymakers' contributions. Concerning this two contributions were identified; first the impact of the public administration model in lean implementation and, second is related to the impact of the underlying barriers.

Impact of the Brazilian public administration model in the lean journey: the research has shown that Brazilian public administration as the provider of the healthcare system has a significant influence on the process. During the data analysis, three out of six underlying barriers related to UHS that might constrain lean implementation emerged. Therefore, attempts to implement lean by managers or practitioners, should consider the previous analysis of the public administration influence in the physicians' work, resource management affecting clinical staff and the model that UHS operates in creating constraints.

The public healthcare system has meaningful participation in defining how lean principles or other process improvements initiatives will be implemented. Therefore, policymakers need to be aware of the challenges to improve the healthcare processes and the characteristics of its modus operandi providing new direction to policies that will prompt future process improvement initiatives in this context. New policies should consider the impact of the stakeholders and the public healthcare system influence in the changing process which could contribute to ease the implementation process and reduce the challenges commonly faced in the healthcare setting.

The impact of underlying barriers brings important implications to managers. This contribution might help healthcare practitioners and managers to avoid the creation of inhibitors during the lean journey in the healthcare setting. The underlying barriers have been underscored as leading causes of common barriers that emerge during lean implementation thus, addressing each of the underlying barriers in healthcare might support the lean implementation and sustainability reducing the impact of restraining forces that come from stakeholders and the UHS.

One of the questions that can be raised about these contributions is why this is happening in healthcare and why it was never discussed in traditional lean settings such as manufacturing. To understand this discussion it is important to recognise the settings in manufacturing are different to services where there is more focus on the value stream map and absence of the co-production process (Henrique *et al.* 2016; Normann, 1991) which brings limited influence of stakeholders on the process. Furthermore, manufacturing companies are not part of a large public organisation that is highly politicized (Glouberman and Zimmerman, 2002). Finally, the majority of implementations carried out in healthcare have been done in a piecemeal way and not as an overarching model (Brandao de Souza, 2009; Radnor; 2010; Radnor and O'Mahoney, 2013) which creates a different scenario for lean implementation.

The findings of this paper contribute to the knowledge and practice bringing a new perspective to lean barriers especially in a new context of a developing country. The paper not only focused on common barriers from the literature (ostensible), but provided understanding of the deeper causes that emerged as underlying barriers. This might be a first insight to rethink the way that the value add is addressed in public healthcare management and, to start a process to identify underlying barriers that will influence the creation of ostensible barriers.

It is expected that outcomes from this research will motivate future applications within and outside the healthcare context. Therefore, research contributions and propositions draw together three main directions for academicians to carry out future research.

The analysis around the underlying barriers has emerged as a robust method to summarise ostensible barriers but the healthcare area is not the only context in which this

can be applied. Future research in other areas using the same approach identifying underlying barriers, restraining forces and ostensible barriers is encouraged.

This research has focused on barriers to implement lean so as a consequence only the restraining forces were identified. Therefore, future research should focus on the identification of driving forces (positive forces) in healthcare that supports lean implementation.

Professional boundaries or professionalism issues during lean implementation in healthcare is still a limited area in terms of research. Therefore, an in-depth analysis of the professionalism issues involving physicians and nurses during lean implementation and sustainability is suggested as future research.

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